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Improvement of an experimental equipment for vibrating a sand-pile -For understanding the mechanism of landslides-

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Landslides have been often triggered by seismic shake and/or rainfall. For example, the 2008 Iwate-Miyagi Nairiku Earthquake induced a massive landslide near Aratozawa Dam in Miyagi prefecture. However, the mechanism of earthquake-induced landslides has not been revealed yet due to the complexity of various factors: geography, geology and groundwater.

Yoshioka (2003) studied the relation between the frequency and the size of avalanches in sand-pile experiments. Nakayama et al. (2014, SSJ) investigated a behavior of a sand-pile when vibration was applied in order to understand the mechanism of the earthquake-induced landslides. They prepared a PET bottle which was cut along its bottom with a cap including a small hole and fixed them on a stand. They dropped dry sand particles in a PET bottle through the small hole and made a sand-pile on an acrylic case on whose bottom a buzzer was attached. Using the buzzer, vibration was input to a sand-pile and recorded the visual behavior of the sand-pile. The size of the sand pile was 60 mm in diameter and 20 mm in height. Two kinds of avalanches were found in their experiments, that is to say, avalanches of the grains of sand independently falling along the sand-pile surface and avalanches of thin sand layers sliding downward along the sand-pile surface. However, such avalanches were not observed on some cases.

In this study, we carried out some more experiments, and went through their experimental condition. We found the spatial variation of amplitudes and dominant frequency of the vibration. In addition, we cannot see the detailed process of avalanches because of lower spatio-temporal resolution.

Then, we try to improve the experimental equipment. For example, we replaced a buzzer to a new one which can change the amplitude and dominant frequency. We changed a shape of the base where we made a sand-pile to reduce spatial variation of the vibration. In addition, we installed a high-speed camera to investigate the process of avalanche in detail.

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